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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/688,873

10/21/2003

Hideyuki Kanzawa

0023-2111P

9360

2292

7590

12/15/2005

BIRCH STEWART KOLASCH & BIRCH

PO BOX 747

FALLS CHURCH, VA 22040-0747

EXAMINER

LIU, BENJAMIN T

ART UNIT

PAPER NUMBER

2826

DATE MAILED: 12/15/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/688,873

Applicant(s)

KANZAWA, HIDEYUKI

Examiner

Benjamin T. Liu

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 14 November 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-19 is/are pending in the application.
- 4a) Of the above claim(s) 1-12 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 13-19 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Minhloan Tran
Minhloan Tran
Primary Examiner
Art Unit 2826

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 21 October 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Oath/Declaration

1. The oath or declaration filed on 10/21/2003 is acceptable.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 13-14, 16-17, and 19 are rejected under 35 U.S.C 102(e) as being anticipated by figure 29 of Ema et al. (6,791,187).

With regard to claim 13, figure 29 of Ema et al. discloses a semiconductor device that comprises a substrate 10; at least one gate 22 over the substrate 10; a PMD layer 36 over the gate 22 and the substrate 10; at least one via hole 122 over the gate 22; and at least one via hole 60 not over the gate 22, wherein the via hole 122 over the gate 22 is not tapered and the via hole 60 not over the gate 22 is not tapered.

With regard to claim 14, figure 29 of Ema et al. discloses a semiconductor device, wherein the via hole 122 over the gate 22 and the via hole 60 not over the gate have the same diameter.

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With regard to claim 16, figures 29 of Ema et al. disclose a semiconductor device, wherein the via holes (60, 122) are filled with metal 70.

With regard to claim 17, figures 29 of Ema et al. disclose a semiconductor device, wherein the metal 70 is at least one selected from the group consisting of tungsten, copper, and copper alloy.

With regard to claim 19, figures 29 of Ema et al. disclose a semiconductor device, wherein the via hole (60, 122) have parallel walls.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 15 and 18 are rejected under 35 U.S.C 103(a) as being unpatentable over figures 29 and 55 of Ema et al. (6,791,187).

With regard to claim 15, figure 29 of Ema et al. discloses all the subject matter claimed except for via holes formed by; depositing a silicon layer over the PMD layer, depositing an antireflective layer over the PMD layer, etching a tapered hole through the antireflective layer and the silicon layer, and anisotropically etching the PMD layer.

However, figure 55 of Ema et al. discloses via holes 38 formed by depositing a silicon layer 158 over the PMD layer 150, depositing an antireflective layer 156 over the

PMD layer 150, etching a tapered hole (38, 40) through the antireflective layer 156 and the silicon layer 158, and anisotropically etching the PMD layer 150. Therefore, it would have been obvious to one of ordinary skill in the art to form the semiconductor device of figure 29 of Ema et al. with silicon and antireflective layers taught in figure 55 of Ema et al. because the antireflective layer reduces standing wave effects in the photoresist by suppressing unintended light reflections, and by using the two layers together (silicon and antireflective layer), the invention makes it possible to completely ignore dimensional changes cause by thickness variations of the films between the base layers. It would also have been obvious to one of ordinary skill in the art to form the semiconductor device of figure 29 of Ema et al. with a tapered hole through the antireflective layer and silicon layer as taught in figure 55 of Ema et al. because this alleviates problems such as the worsened dimensional variance caused by differences in the thickness of interlayer films on the active region, gate and other wafer surfaces. The increase in diameter of the opening in the upper part of the contact minimizes the short circuits between connection lines and other metal conductors formed on the upper part of the contact.

With regard to claim 18, figures 29 of Ema et al. discloses all the subject matter claimed except for via holes lined with titanium.

However, figure 55 of Ema et al. discloses via holes (38, 40) lined with titanium. Note lines 18-24 in column 27 of Ema et al. Therefore, it would have been obvious to one of ordinary skill in the art to form the semiconductor device of figure 29 of Ema et al.

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with via holes lined with titanium as taught by figure 55 of Ema et al. because titanium sputtered via holes reduces resistance at the contacts.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Benjamin T. Liu whose telephone number is (571) 272-6009. The examiner can normally be reached on Mon-Fri 9:30 AM-6:00AM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nathan Flynn can be reached on 571 272 1915. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

BTL